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MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF VASSAR COLLEGE.

COMMUNICATED BY M. F. WASHBURN.

I. SOME EXPERIMENTS ON THE ASSOCIATIVE POWER OF SMELLS.

By ALICE HEYWOOD and HELEN A. VORTRIEDE.

The observation that smells possess a greater power to revive past experiences is so frequently made in every-day life, that it seemed worth while to attempt a laboratory test of its correctness. Of course, when a psychic phenomenon fails to manifest itself under the artificial conditions of laboratory experiment, it is not thereby proved to be an illusion in ordinary experience. But at least its non-occurrence under the fairly well known and simple circumstances of an experiment would indicate that the cause of its appearance out of the laboratory lies among the complexer conditions that are not reproduced by the method used.

The first series of experiments performed by us attempted to test the power of smell qualities to revive pictures which were presented to the observer at the same time with the smells. The method followed in general outline the Calkins method of studying associations. The observer was allowed to look at a picture laid before her on the table for five seconds, while inhaling an odor from a phial held to her nostril by the experimenter. After an interval of one minute another picture and another odor were given. When six pictures and six odors had been presented, the series of odors was given in a different order, and the observer described whatever imagery was suggested to her mind. The pictures were magazine illustrations about 6 x 8 inches in size, and were chosen as being about equal in vividness or exciting character. It was not, of course, possible to secure perfect equality of intensity in the odors, but the observer was instructed to report whenever an odor was disturbingly different in intensity from the rest.

The results of this series, as of all subsequent series, were treated in the following manner. Cases where the association between odor and picture might have been due to primacy, recency, or vividness were first ruled out. The percentage of

correct associations minus these cases was then calculated. In the next place the number of mistakes was reckoned when the association had, according to the observer's introspection, taken place by means of an ideational link, as for example, when the smell of rubber suggests the accompanying picture of a booted man through the medium of 'rubber boots.' These cases were set aside. There were left, besides the instances where no association or a wrong association was formed, two other classes: cases where the smell revived the picture for no reason whatever so far as the observer could discover by introspection, and cases where the link was affective in its character. Sometimes, for example, the observer would connect odor and picture because they were both disagreeable, or both pleasant. In this class, too, were reckoned the cases where the link was a sense of incongruity between smell and picture, as when a perfume accompanied a picture of a blacksmith's shop. The psychological nature of 'incongruity' is a matter of some dispute, but at least in such a case it is not an idea in the sense that 'rubber boots' is an idea.

Pictures were used in this first series of tests rather than simpler material because it is precisely the revival of such complex images that we have to deal with in ordinary life, where the superiority of smells as regards associative power is supposed to be manifest. In the later series, however, squares of differently colored paper were substituted for the pictures, in the hope of diminishing the number of associations through ideational links. Although the work with the pictures was thus left incomplete, inasmuch as no experiments were made testing the power of other material besides odors to recall them, the following table of results for the first series is subjoined. The observers, S. and B., were students of psychology with a fair amount of practice in introspection.

TABLE I.

Observer	I.	II.	III.	IV.	V.
S	42	66	16	30	54
B	48	77	37	2	61

Column I gives the number of experiments with each observer; column II, the percentage of correct associations less obvious cases of primacy, recency and vividness; column III the percentage of correct associations which had no discoverable link; column IV the percentage of correct associations that had affective links; and column V the percentage of correct cases

with ideational links. It may be worth noting that an attempt to substitute small squares of colored paper for the odors in the picture experiments was abandoned because the colors practically never failed to recall the pictures, as they were always mentally 'fitted into' the pictures by the observer, the color being assigned to some object so that picture and color formed a single perception.

Table II gives the results of experiments where smells were given along with squares of differently colored papers, about four inches to a side. These were manipulated as the pictures had been.

TABLE II.

Observer	I.	II.	III.	IV.	V.
S	42	69	33	14	52
B	36	58	33	8	59

The columns have the same significance as in Table I. It will be noticed that despite the greater complexity of the pictures as objects of perception and the consequent apparent probability that ideational links will be formed between them and the odors, the percentage of cases where such associations were actually formed, as shown in column V, is hardly noticeably less with the colors.

Table III, finally, shows the results of a series made with nonsense syllables, spoken by the experimenter, substituted for the smells, and associated with colors as in the series just described.

TABLE III.

Observer	I.	II.	III.	IV.	V.
S	42	88	45	12	43
B	54	79	51	14	35

The following conclusions are indicated on a comparison of the results, and by the introspection of the observers.

(1) The odors have no superiority in suggestive or associative power over the nonsense syllables.

(2) The cases where the link is affective rather than ideational have a special interest because it is sometimes suggested that smells derive their associative power from their power to reproduce affective states or moods. Observer S. showed a

decided tendency to associate odors with pictures by feeling links (see Column IV, Table I); on the other hand, she was quite as successful in associating odors with colors, where only 12% of the correct associations were made through affective connections. Observer B.'s tendency to associate by affective links was somewhat greater in the experiments with nonsense syllables (see Column IV, Table III) than in the smell experiments. On the other hand it may be urged that the cases of 'no link' possibly involved undetected affective connections; and we may note, also, that no account was taken of the instances where the link may have been both ideational and affective; only where it was purely affective was the case recorded.

(3) Links, ideational or affective, operate to assist recall not only in themselves, but through the fact that where they exist they give greater vividness and force to the impressions at first presentation. Probably a considerable portion of the effectiveness of incongruity, for example, as a link is due to the observer's paying more attention to the impressions because they are incongruous. It is further worth notice that while pleasantness and unpleasantness occasionally led to mistaken associations, *i. e.*, if there were two unpleasant colors in a series, an unpleasant smell might suggest the one with which it was not actually experienced, incongruity, where it operated at all, always brought about the right association.¹ Its 'relational' character seemed to connect it inseparably with both terms of the relation.

(4) Can any explanation be suggested for the fact that the commonly accepted superiority of smells in associative power does not appear under these conditions?

Smell sensations have in several respects a peculiar position among mental phenomena. They are, for one thing, more isolated than most other sensational elements. They come to us oftener detached from closely welded sensation complexes than do other kinds of sensation. Sound elements approach them in this respect; we have 'wandering sounds' as well as 'wandering odors,' but sound sensations are employed in intimate association with other elements in language. The closest fusion of smell sensations with other kinds occurs in those qualities which are associated with tastes, but these form only a small proportion of the total number of smell qualities. Now it may plausibly be supposed that when a sensation occurs in relative isolation, its associative power, its *central erregende*

¹ Associations are ascribed to affective links in these experiments simply on the introspective testimony of the observers that a common feeling tone was the cause of associating two processes. It is not intended to prejudice the question as to how far affective processes may properly be said to mediate association.

Wirksamkeit, to use Külpe's phrase, may be less restricted to one uniform set of accompanying elements than if it ordinarily occurs in a complex.

Further, any given smell quality is of comparatively rare occurrence in our mental life. This is due to two circumstances: the enormous number of qualitative differences in smells, and, still more, the fact that the organ of smell is so readily fatigued. The smells that constantly surround us disappear from our consciousness through fatigue; compared to the frequency with which we experience all the visual qualities and auditory qualities, we experience a distinct sensation of smell very rarely.

The result is that smell sensations as they occur in ordinary life are attended to in a greater degree, and more for their own sake, as it were, than any other sensation qualities. The smell of box recalls a garden frequented in childhood; no visual quality and no auditory quality is so infrequent and so detached an element of experience as the smell of box. The power of smells to revive associations is due largely to the conditions which favor attention to them in every-day life. Where, as under the circumstances of these laboratory experiments, the conditions are so arranged that attention does not favor smell sensations more than other material, such as nonsense syllables, the superiority of smells in associative power fails to appear.